Performance Task: The Wishing Club

This task develops the concept addition of fractions using equivalent fractions with a variety of manipulatives. It is important for students to solve multiple problems over time using concrete models and representing these models on paper. With the representations, it is important for students to write the abstract fraction equations. Students then must explain their thinking, representations, and models.

STANDARDS FOR MATHEMATICAL CONTENT

MCC5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*

MCC5.NF.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.*

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

ESSENTIAL QUESTIONS

- How can looking at patterns help us find equivalent fractions?
- How are equivalent fractions helpful when solving problems?
- How can a model help us make sense of a problem?
- How can making equivalent fractions, and using models, help us solve problems?
- When should we use models to solve problems with fractions?
- What connections can we make between the models and equations with fractions?

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MATERIALS

- Pencil
- Journal, Learning Log, Student Problem Solving Notebook, etc.
- Accessible manipulatives
- Copy of task.

GROUPING

Pair/Small Group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments:

This task was developed from the story The Wishing Club, by Donna Jo Napoli. A brief summary of Ms. Napoli's story is printed below, in case this wonderful book is not in your library.
The goal of this task is for students to make sense of and practice solving fraction problems with unlike denominators, where addition is the operation to use. The difficult part for the teacher is to not give students an algorithm (find common denominators) before the task. It is much more beneficial for students to struggle with the idea of how to go about combining two fractions with unlike denominators. This struggle is where the learning happens, but the teacher must provide facilitating questions at the end of the lesson to bring the students' own understanding to light. A student journal question, asking what students learned or what they are still struggling with when adding fractions with unlike denominators would make a good formative assessment and it would give students time to reflect on their own thinking (metacognition) and understanding.

BACKGROUND KNOWLEDGE

Students can use any representations they wish, but they will always use representations that are familiar to them. Pattern blocks make great fraction manipulatives, but they can be limiting since the imply part to whole more often than part to set (or group). It is necessary for students to have multiple models for fractions in order to facilitate flexibility in representations and computation.

Teacher Notes:

Part I

Read the story The Wishing Club, to your students, or if the book is not available, set up the problem by telling a story of four children who wished upon a star:

> The first boy was 4 and he wished for a dollar, but only received a quarter. His 2 year old brother wished for a cookie, but only got half. Their 8 year old twin sisters received even smaller parts of their wishes.

(This may be a good time to set up a table with your students to see if they can find the pattern)

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Age	part of wish
2	½
4	¼
8	?

Can they combine their parts to get a whole wish? Can they get a whole pet? They have to be careful and make sure they're correct (who wants half of a puppy?).

Show how you think they can get a full wish granted.

Allow pairs of (or small groups of) students to puzzle over the problem. Listen for students making sense of the context. Are students using manipulatives and/or making models. Are students using models that are easily broken into fractional parts?

Look for students who are relying heavily on models and manipulatives to solve the problem. Everyone should create a model for the problem as well as use equations, but during the closing part of the lesson, allow some of the students who relied heavily on manipulatives to share first. Allow students who used more abstract thinking (but who also model the problem and solution) to share last.

FORMATIVE ASSESSMENT QUESTIONS

- How can you tell that your answers are correct?
- How do you know that your points on the number line are labeled correctly?
- What other names do you think there are for some of your points on the number line?
- Did you identify any patterns or rules for adding these kinds of fractions? Explain what you have found!

After enough time has been devoted to the task, group partners with other partners to make groups of 4-6 students. Appoint a facilitator to guide the group and make sure everyone shares their thinking. Pay attention to students' talk and make note of what is discussed during this time as it may give you some ideas about who should share and in what order they should share with the whole group. When students have finished, come back to the large group and begin the closing of the lesson. The goal of this closing is to help students make further generalizations about adding fractions and to help them become more fluent. Help students reach this goal, not by telling, but by asking thought provoking questions about the work and asking students to share in an order that moves from least efficient to most efficient, or mostly concrete to more representational and abstract.

Part II

Begin this lesson by reviewing the work from the previous lesson. Review any generalizations made and introduce the next part of the task.

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Make sure everyone understands the context of the task. Let students know that the task they completed previously was a warm-up for the next task. In this task, students will be asked to find other ages of family members that would allow them to make a wish and get a complete pet.

Ask students to share initial thoughts about whether they think the children in their family could wish for and get a whole pet. Ask them to share how they know (some may say they are an only child, so they couldn't get a whole animal, others may point out that they are the youngest, so the pieces everyone else gets are smaller than theirs).

Give pairs of students the task for the day and ask them to find several different ages of children that would allow a wish for a whole pet.

FORMATIVE ASSESSMENT QUESTIONS

- *How can you tell that your answers are correct?*
- *What did you do to add the fractions together?*
- *Did you use any patterns or rules for adding these kinds of fractions? Explain what you have found!*

After enough time has been devoted to the task, Combine student pairs to make groups of 4-6 students. Appoint a facilitator to guide the group and make sure everyone shares their thinking. Pay attention to students' talk and make note of what is discussed during this time as it may give you some ideas about who should share and in what order they should share with the whole group.

When students have finished, come back to the large group and begin the closing of the lesson. The goal of this closing is to help students make generalizations about adding fractions. Help students reach this goal, not by telling, but by asking thought provoking questions about the work and asking students to share in an order that moves from least efficient to most efficient, or mostly concrete to more representational and abstract.

Questions for Teacher Reflection

- How did my students engage in the 8 mathematical practices today?
- How effective was I in creating an environment where meaningful learning could take place?
- How effective was my questioning today? Did I question too little or say too much?
- Were manipulatives made accessible for students to work through the task?
- One positive thing about today's lesson and one thing you will change.

Technology

http://www.counton.org/games/map-fractions/racing/ this is an interactive board game where players race bikes on a game board by adding fractions with like denominators.

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http://www.counton.org/games/map-fractions/frosty/ this is an interactive three across board game where players add fractions with like and unlike denominators and place a virtual counter on the sum. The first to get three in a row wins the game.

http://www.k-5mathteachingresources.com/ this site offers simple contextual problems to use to extend and support students in their understanding of fraction computation and all problems are correlated to CCSS.

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The Wishing Club - Part I

Is there a way for the two year old, the four year old and the twin eight year old sisters to wish for one whole animal? Show your mathematical thinking.

The Wishing Club - Part II

Can you think of any other combinations of ages in a family that would have allowed them to make a wish and get a whole pet? Show your mathematical thinking.

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